

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



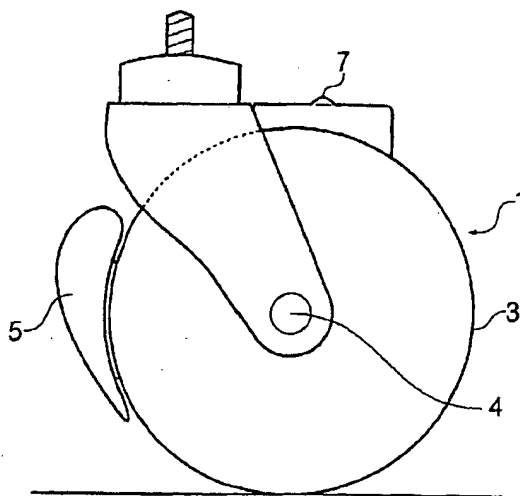
(43) International Publication Date
15 April 2004 (15.04.2004)

PCT

(10) International Publication Number
WO 2004/031017 A1

- (51) International Patent Classification⁷: **B62B 5/04**
- (52) International Application Number:
PCT/GB2003/004095
- (22) International Filing Date:
29 September 2003 (29.09.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
0222672.8 1 October 2002 (01.10.2002) GB
- (71) Applicant (for all designated States except US): **GRAY MATTER (ALPHA) LIMITED** [GB/GB]; The Point, 11 Beadle Garth, Copmanthorpe, York YO23 3YJ (GB).
- (72) Inventor; and
- (73) Inventor/Applicant (for US only): **GRAY, Andrew** [GB/GB]; The Point, 11 Beadle Garth, Copmanthorpe, York YO23 3YJ (GB).
- (54) Agent: **HARRISON, Goddard, Foote**; 31 St. Saviourgate, York YO1 8NQ (GB).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: BRAKING ASSEMBLY



(57) Abstract: There is described a vehicle braking assembly for a wheel which comprises a braking member arranged to move relative to the main body of the wheel between an inoperative and an operative position, blocking means adapted to prevent the braking member from moving to an operative position characterised in that the trigger means is operable by coded message passed by a separate transmitter as electromagnetic radiation and the assembly is provided with an LMR sensor.

WO 2004/031017 A1

The present invention relates to a novel braking assembly, a novel security system associated thereto and a novel method of theft prevention, e.g. of wheeled carriages.

5

The novel braking assembly of the present invention may be suitably used in a variety of vehicles. However, it is especially suited for use on or in conjunction with a shopping trolley or cart.

10 European Patent No. 1 101 685 describes a vehicle braking assembly in which a braking member is activated by movement of the assembly over a magnetic material such that, when activated, the braking member moves to an operative position which serves to raise the wheel from the ground, hence preventing the vehicle from progressing beyond the magnetic material.

15

Other braking mechanisms are known, which operate, for example, by radio signal, infra red signal, etc. However, such braking devices generally require a motor to operate the braking mechanism. One particular disadvantage of electronic braking devices is that they require a power source, for example, a battery, to operate the
20 receiver and/or other electronic parts. For the systems to function properly, the battery must be constantly checked or monitored and replaced or recharged.

A further disadvantage of known braking assemblies and/or anti-theft systems is that, once triggered, they must be reset.

25

We have now developed a braking assembly which overcomes or mitigates some of the disadvantages of the prior art.

In particular, the braking assembly of the present invention is advantageous in that,
30 *inter alia*, a generator may be provided to power electronic components and/or to recharge a solid state battery. Furthermore, the generator may be operably linked to

one or more wheels of the vehicle and thus the user of the cart or trolley will provide the motion for the generator.

- 5 The braking assembly of the present invention is advantageous in that it may be used in a manner analogous to existing assemblies, that is, to prevent a cart or trolley from being removed from, for example, a retailer's car park. However, in addition, the assembly of the invention may prevent a cart or trolley from being removed from the store, hence preventing unpaid for goods from being removed from the store.
- 10 The braking assembly of the present invention may also be used on a variety of wheels, including conventionally known trolley or cart wheels, but also including wheels used on, for example, moving walkways. By the term wheel it is intended to include wheels as hereinbefore described castors, etc.
- 15 Thus, according to the invention we provide a vehicle braking assembly for a wheel which comprises a braking member arranged to move relative to the main body of the wheel between an inoperative and an operative position, blocking means adapted to prevent the braking member from moving to an operative position and trigger means adapted to activate the braking member to move to an operative position
- 20 characterised in that the trigger means is operable by a coded message passed by a separate transmitter as electromagnetic radiation and the assembly is provided with an EMR sensor.

- Any conventionally known brake foot may be used. However, preferentially, the
- 25 brake foot is the same or similar to that described in European Patent No. 1 101 685 which is incorporated herein by reference.

- The wheel may optionally be provided with a circumferential brake guide, e.g. in the form of a circumferential slot or groove.

30

Thus a wheel assembly of the invention may comprise a wheel or castor, supported in a fork and fixed using an axle fastening means, e.g. an axle bolt. The wheel may also be provided with a peripheral brake foot.

5 A variety of electromagnetic radiation (EMR) may be used to trigger and/or reset the braking assembly. Thus the EMR may comprise, radio waves, i.e. short or long wave radio waves, light waves, e.g. infra red light, visible light, UV light or any combination thereof. Preferably the light source comprises an infra red light source.

10 An EMR sensor may be positioned in any reasonable location on the wheel assembly, preferably the sensor is positioned in a well exposed position towards the upper part wheel assembly in its normal "in use" position.

15 In a preferred embodiment of the invention, the braking mechanism of the invention comprises a latch, which is operably linked to the sensor. An inner portion of the wheel comprises recessed toothed region, positioned such that, when desired, the latch may engage with one or more of the teeth. Thus, when the brake is in the inoperable position, the latch is closed and the wheel and the recessed toothed portion freely rotates. When the latch is triggered, it engages with a toothed region of the recessed portion of the wheel. The continued rotation of the wheel and the engaged latch moves the brake from an inoperable position to an operable and
20 braking position.

25 Thus, according to a further aspect of the invention we provide a vehicle braking assembly for a wheel which comprises a braking member arranged to move relative to the main body of the wheel between an inoperative and an operative position, blocking means adapted to prevent the braking member from moving to an operative position and trigger means adapted to activate the braking member to move to an operative position characterised in that the trigger means comprises a latch which is adapted to engage with a toothed portion of the body of the wheel.

30

Any conventionally known blocking means may be utilised. However, preferentially, the blocking means will comprise a resilient biasing member which is adapted to urge the braking member into the inoperable position. Preferably, the biasing member will comprise a resilient spring, e.g. a torsion spring. The spring is
5 preferably situated adjacent or around the axle of the wheel assembly. In an especially preferred embodiment the wheel assembly may be provided with an axial housing for resilient spring. Thus, in use, the spring biasing means will retain the brake in the inoperable position until the trigger is activated.

10 It will be understood by one skilled in the art that the vehicle wheel assembly provided with a latch assembly as hereinbefore described may comprise any conventionally trolley or cart wheel which requires a braking mechanism. However, preferentially, this aspect of the invention comprises a vehicle wheel assembly provided with a latch assembly wherein the vehicle wheel assembly is an assembly
15 comprising a sensor as hereinbefore described.

Preferentially, the latch is adapted to operate in a radial direction and thus, the recess portion of the wheel is in a substantially circumferential position. Although it will be understood that the recess which co-operates with the latch may be positioned such
20 that the latch moves radially, rather than circumferentially. However, circumferential movement of the latch is preferred.

Furthermore, the braking system will operate with a single toothed recess portion the reaction time to the trigger is faster if the assembly is provided with a plurality of
25 toothed recesses.

In the braking assembly of the invention the latch is preferably operated by a solenoid, electric motor, stepper motor, etc.

It is a particular advantage of the present invention that the braking mechanism does
30 not require to be manually reset. Thus, after the solenoid and latch mechanism has been triggered so as to activate the breaking mechanism, a second EMR source may

be provided which acts as a resetting beam, e.g. triggering the solenoid, motor and/or bellows to revert to its rest position. Thus the action of the aforementioned biasing means which urges the braking mechanism into an inoperable position, acts to reset the assembly without need for manual interference.

5

Furthermore, in a retail environment that has, for example, an EMS tagging security system, such an EMS system may be linked to an EMR source transmitter as hereinbefore described, thus, for example sending a brake triggering message to braking assembly device on the wheel causing the brake to activate immediately.

10

The solenoid or motor may, preferably be provided with a support power supply e.g. in the form of a battery and a programmable integrated chip. It is a further advantage of the present invention to provide a wheel assembly which is also adapted to act as a generator.

15

Thus, in a further aspect of the invention we provide a vehicle wheel assembly adapted to act as a power generator comprises a fixed body member and a rotatably mounted wheel member characterised in that one of the body member and the wheel member is provided with a stator and the other member is provided with a plurality of permanent magnets which are of alternating polarity.

20

In a preferred embodiment of the invention, the stationary portion of the wheel assembly e.g. the portion housing the latch assembly, may be provided with a stator and the rotatable portion of the wheel assembly e.g. the wheel itself may be provided with one or more permanent magnets. Preferentially the wheel is provided with a plurality of permanent magnets which are of alternating polarity. Thus, in use, rotation of the wheel causes the permanent magnets to pass the stator and generate an electromagnetic field current.

25

It will be understood by one skilled in the art that the vehicle wheel assembly provided with a power generator as hereinbefore described may comprise any

30

rotating as part of normal use when the latch 10 is operated around pivot point 11 as shown in Fig 6 there will be a connection between tooth and latch which will drive the brake member to rotate from its first to its second and triggered position. The braking member also includes the brake foot 12 which comes between the wheel and the ground in the braking position. There is provided within the body the slot 8 but this is limited in length to stop the brake member from rotating through too great an angle and become ineffective. There is shown on the braking member a contact point that will come against the end of the slot to prevent further rotation. There is also provided in the braking member a cut away section 14 which will allow for the provision of a solenoid or motor 15.

In Fig 7 there is shown a body of the castor 6 with light collector 7 and solenoid or motor 15. There is provided within a body a sealed chamber 16 which will also contain a programmable integrated chip 17 and a rechargeable support battery 18. The solenoid could then operate from within this sealed area and its required movement can be transmitted through flexible bellows 19. When triggered the solenoid or motor 15 will extend and rotate the latch around pivot point 11 to engage one of the teeth 9 within the wheel 3a.

When the braking system is no longer required the solenoid or motor 15 will return from its extended position and thereby allow the latch to drop out of engagement. In order to return the braking member to its first position there is provided a spring 20 which will be overcome while the user is pushing the trolley against the tooth connection but when there is no pushing it will bring the braking member back to its first position. There is also provided a stop section 21 in slot 8.

If the wheel is used in conjunction with a moving walkway there will be provided on the base of the body a pad 22 which will grip the grid of the moving walkway in the usual way.

Figure 8 shows wheel 3b which has set into it a number of magnets 23 they will be arranged with a north pole and a south pole facing inward alternately to provide a rotor as part of the generator. The stator 25, as shown in Figure 9 being a view through line 1 with the inclusion of the stator is coil arrangement 24 of known type.

5 As a small wheel such as a 125mm castor rotates often while being pushed at a reasonable walking pace it is expected that a generator of this type will provide ample power for the device's requirements. Advantageously a generator constructed in this way could have a membrane between the rotor and the stator that will prevent the ingress of dirt from damaging the workings of the stator. Figure 10 shows the

10 recess within wheel 3a and two kinds of tyre one conventional rubber or polyurethane 10a and the other suitable for the walkway application 10b.

Figure 11 shows a likely use of the invention at the perimeter of the store car park where twin and parallel beams are emitted from a single or dual container. The

15 programmable chip in the device will respond to different coded messages contained within the beams. In the illustration beam 26 will be recognised as a reset instruction and beam 27 as a trigger message. Therefore, and assuming that the vehicle is in area permitted by the owner, when the vehicle is being pushed out through the beams it will receive a reset message which will be ignored and then the trigger message. In

20 response to the trigger message the solenoid or motor 15 will operate outward to rotate the latch 10 and generally engage the brake member 5 with the wheel 3a. The solenoid or motor may only operate for a given period but then operate again if the vehicle is not pushed through the reset beam. When the device is pushed or dragged through the reset beam then the motor will operate and the return means 20 will bring

25 the brake member to its inoperable position. A similar operation could be achieved by the use of two radio transmitters where one signal is generally set beyond the first.

Advantageously, the same system of triggering the device can be used in the store where the device receives a message from a transmitter as it enters an area, for

30 example a supermarket sales floor. The device will receive a number of other messages from additional emitters within the area to which it may respond by

braking. The general purpose of this would be to permit a trolley to leave the store only if it had passed through a paying point, for example a check out desk. Various timer lockouts can be programmed in to the chip to allow, for example, a trolley to leave within sixty seconds as experience has shown that people walk in and out of stores without shopping. In this way the present invention can both prevent trolleys from being removed from the site but also prevent goods from being removed by trolley if they have not passed through the payment area.

10

15

20

25

30

35

40

CLAIMS

1. A vehicle braking assembly for a wheel which comprises a braking member arranged to move relative to the main body of the wheel between an inoperative and
5 an operative position, blocking means adapted to prevent the braking member from moving to an operative position and trigger means adapted to activate the braking member to move to an operative position characterised in that the trigger means is operable by a coded message passed by a separate transmitter as electromagnetic radiation and the assembly is provided with an EMR sensor.
- 10 2. A vehicle braking assembly device according to Claim 1 characterised in that the brake foot is the same or similar to that described in European Patent No. 1 101 685.
- 15 3. A vehicle braking assembly device according to Claim 1 characterised in that the wheel is provided with a circumferential brake guide.
4. A vehicle braking assembly device according to Claim 3 characterised in that the circumferential brake guide is in the form of a slot or groove.
- 20 5. A vehicle braking assembly device according to Claim 3 characterised in that the brake guide is provided on only a portion of the circumference of the wheel.
6. A vehicle braking assembly device according to Claim 3 characterised in that
25 the circumferential brake guide is formed by the mating of a pair of facing wheel members.
7. A vehicle braking assembly device according to Claim 3 characterised in that
30 each of the wheel member comprise a wheel and a wheel body, the diameter of the wheel body being less than the diameter of the wheel.

comprises a latch which is adapted to engage with a toothed portion of the body of the wheel.

16 A vehicle braking assembly according to Claims 1 or 15 characterised in that
5 the wheel comprises a braking member arranged to move relative to the main body of the wheel between an inoperative and an operative position, blocking means adapted to prevent the braking member from moving to an operative position and trigger means adapted to activate the braking member to move to an operative position characterised in that the trigger means comprises a latch which is adapted to engage
10 with a toothed portion of the body of the wheel.

17. A vehicle braking assembly device according to Claim 16 characterised in that an inner portion of the wheel comprises recessed toothed region, positioned such that when the trigger is activated the latch engages with a tooth.

15

18. A vehicle braking assembly device according to Claim 17 characterised in that when the brake is in the inoperable position, the latch is closed and the wheel and the recessed toothed portion of the wheel freely rotates and when the trigger is activated the latch engages with a toothed region of the recessed portion of the wheel
20 which acts to move the brake from an inoperable position to an operable position.

19 A vehicle braking assembly device according to Claim 18 characterised in that the latch is adapted to operate in a radial direction and the toothed portion of the wheel comprises a substantially circumferential recess.

25

20. A vehicle braking assembly device according to Claim 19 characterised in that the wheel is provided with a plurality of toothed recesses.

21. A vehicle braking assembly device according to Claim 16 characterised in
30 that the blocking means comprises a resilient biasing member which is adapted to urge the braking member into the inoperable position.

22. A vehicle braking assembly device according to Claim 21 characterised in that the biasing member comprises a resilient spring.
- 5 23. A vehicle braking assembly device according to Claim 22 characterised in that the spring is situated adjacent or around the axle of the wheel assembly.
24. A vehicle braking assembly device according to Claim 23 characterised in that the wheel assembly may be provided with an axial housing for resilient spring.
- 10 25. A vehicle braking assembly device according to Claims 1 or 15 characterised in that the braking mechanism is adapted to be automatically reset.
26. A vehicle braking assembly device according to Claim 25 characterised in that a second EMR source is provided which acts as a resetting beam,
- 15 27. A vehicle braking assembly device according to Claim 27 characterised in that the second EMR source triggers the solenoid, motor and/or bellows to revert to its rest position.
- 20 28. A vehicle braking assembly device according to Claim 1 characterised in that the EMR source is operably linked to an EMS tagging security system.
29. A vehicle braking assembly device according to Claim 15 characterised in that the latch is preferably operated by a solenoid or motor.
- 25 30. A vehicle braking assembly device according to Claim 29 characterised in that the solenoid or motor is operably linked to a bellows.
31. A vehicle braking assembly device according to Claim 29 characterised in that the solenoid is provided with a support power supply.
- 30

32. A vehicle braking assembly device according to Claim 31 characterised in that the support power supply is in the form of a solid state battery.

33. A vehicle braking assembly device according to Claim 29 characterised in that the solenoid is operably linked to a programmable integrated chip.

34. A vehicle braking assembly device according to Claim 1 characterised in that the wheel assembly is adapted to act as a generator.

35. A vehicle braking assembly device according to 31 characterised in that the generator is provided adapted to recharge the support power supply.

36. A vehicle wheel assembly adapted to act as a power generator comprises a fixed body member and a rotatably mounted wheel member characterised in that one of the body member and the wheel member is provided with a stator and the other member is provided with a plurality of permanent magnets which are of alternating polarity.

37. A vehicle wheel assembly according to Claim 36 characterised in that one of a wheel member and a wheel body member is provided with a stator and the other member is provided with a plurality of permanent magnets which are of alternating polarity.

38. A vehicle wheel assembly according to Claim 36 or 37 characterised in that the body member is provided with a stator and the wheel member is provided with a plurality of permanent magnets.

39. A vehicle braking assembly or wheel assembly substantially as described with reference to the accompanying drawings and examples.

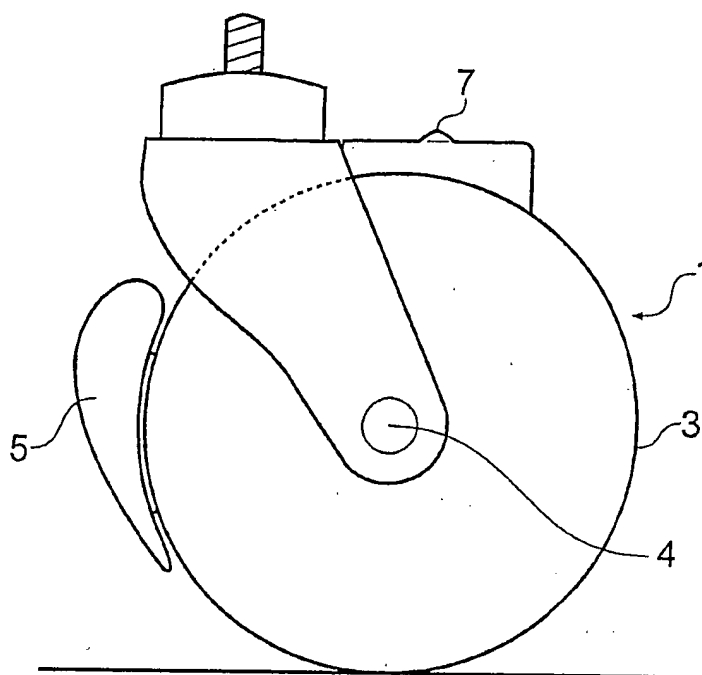


Fig. 1

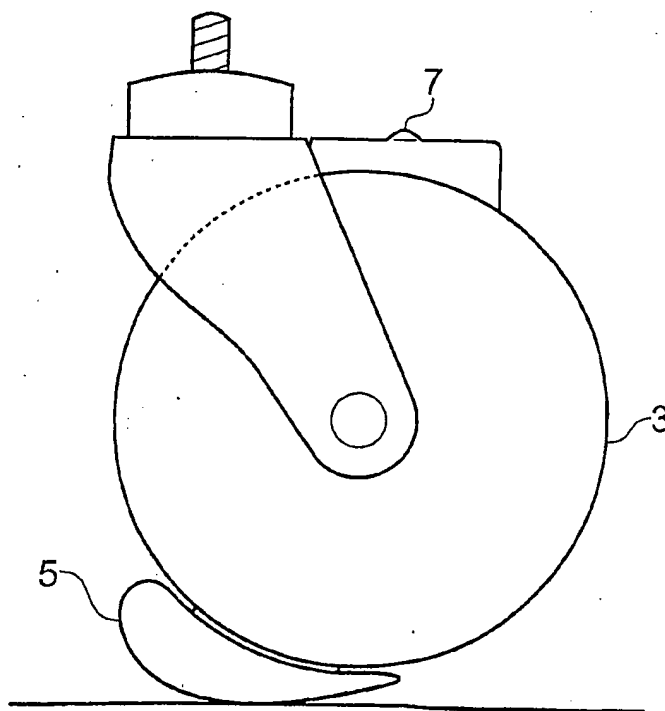


Fig. 2

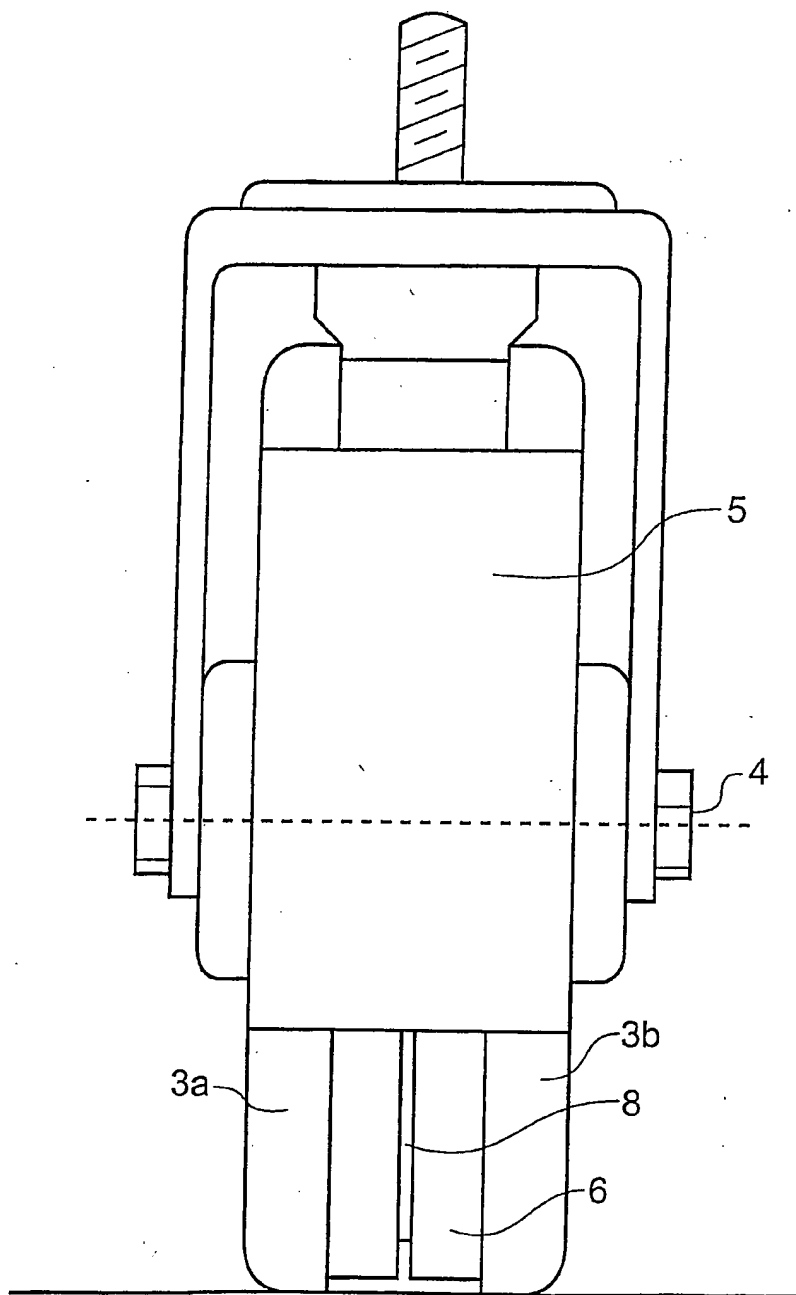


Fig. 3

3/8

10/529773

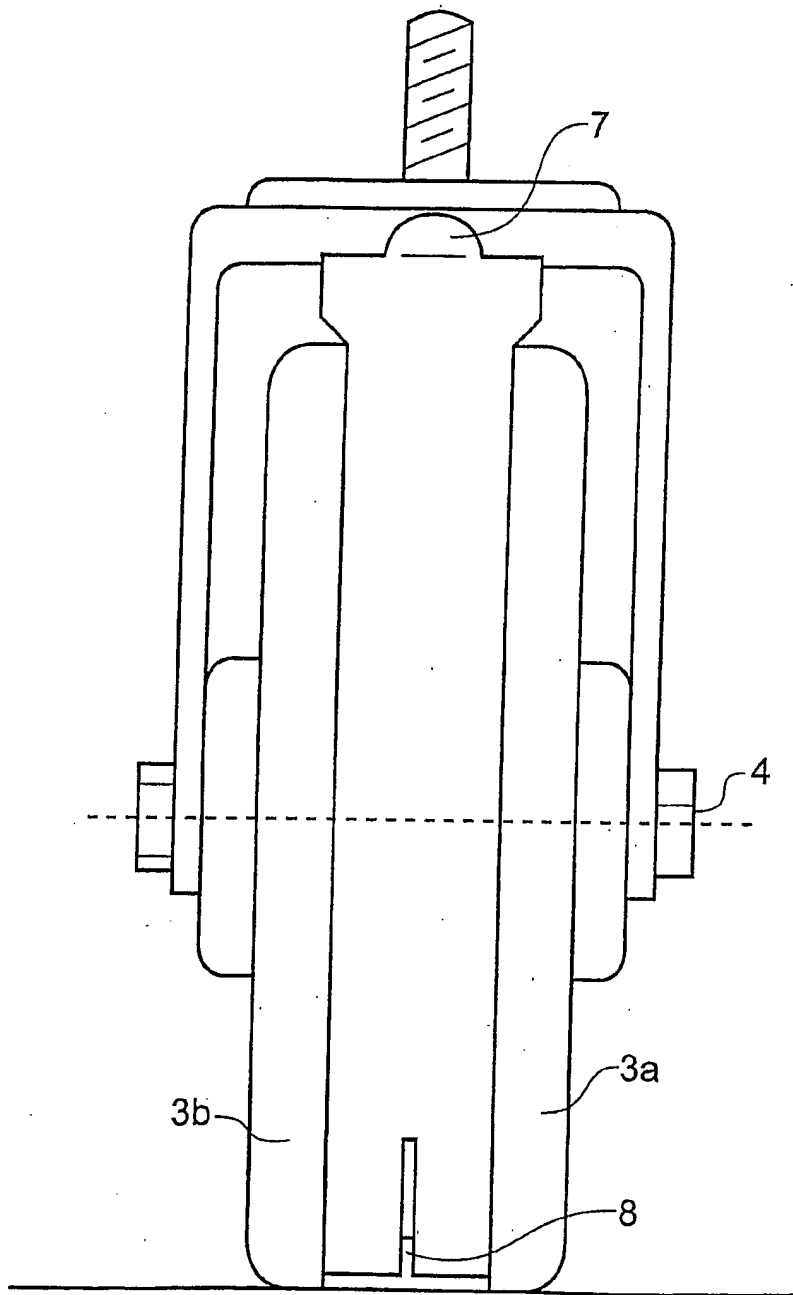


Fig. 4

4/8

10/529773

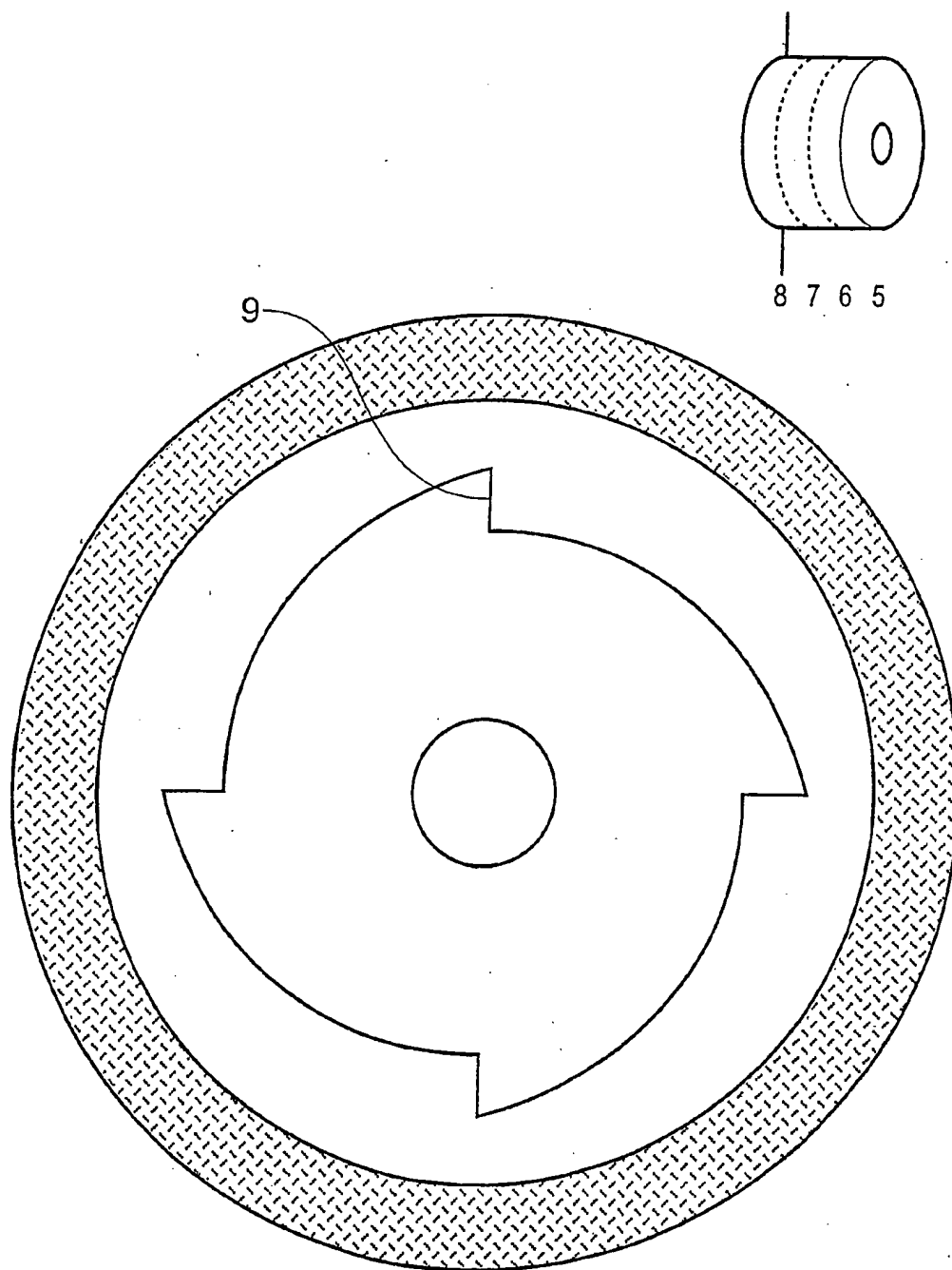


Fig. 5

5/8

10/529773⁴

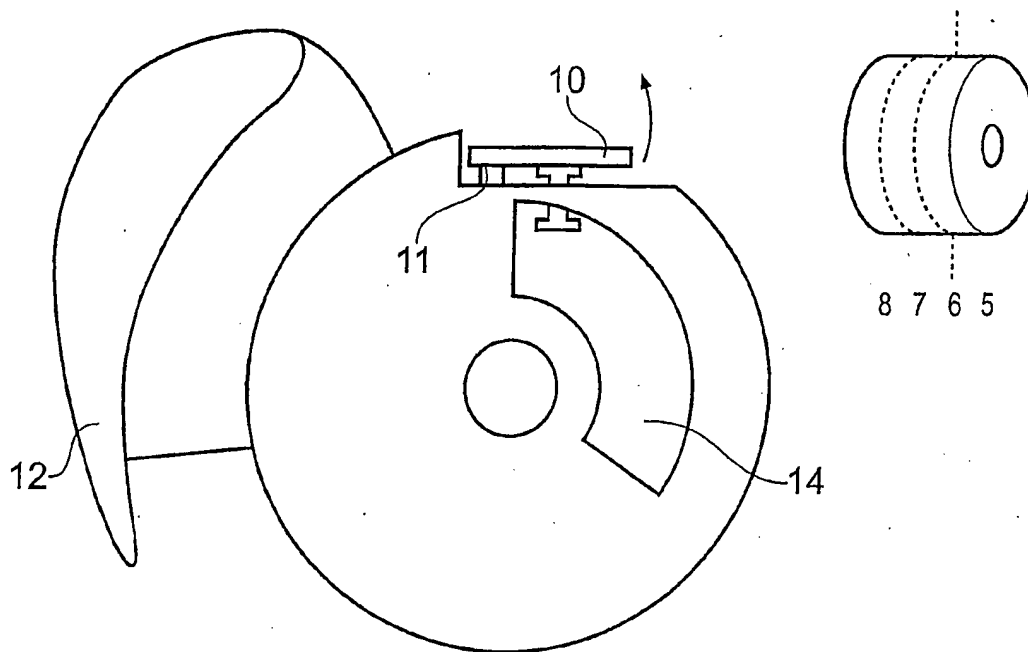


Fig. 6

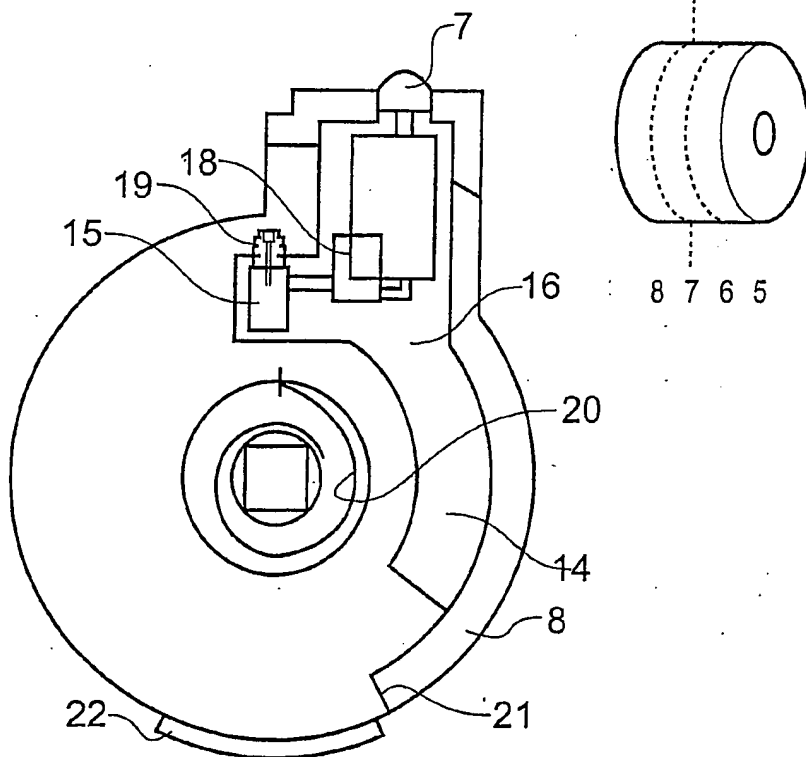


Fig. 7

10/529773

6/8

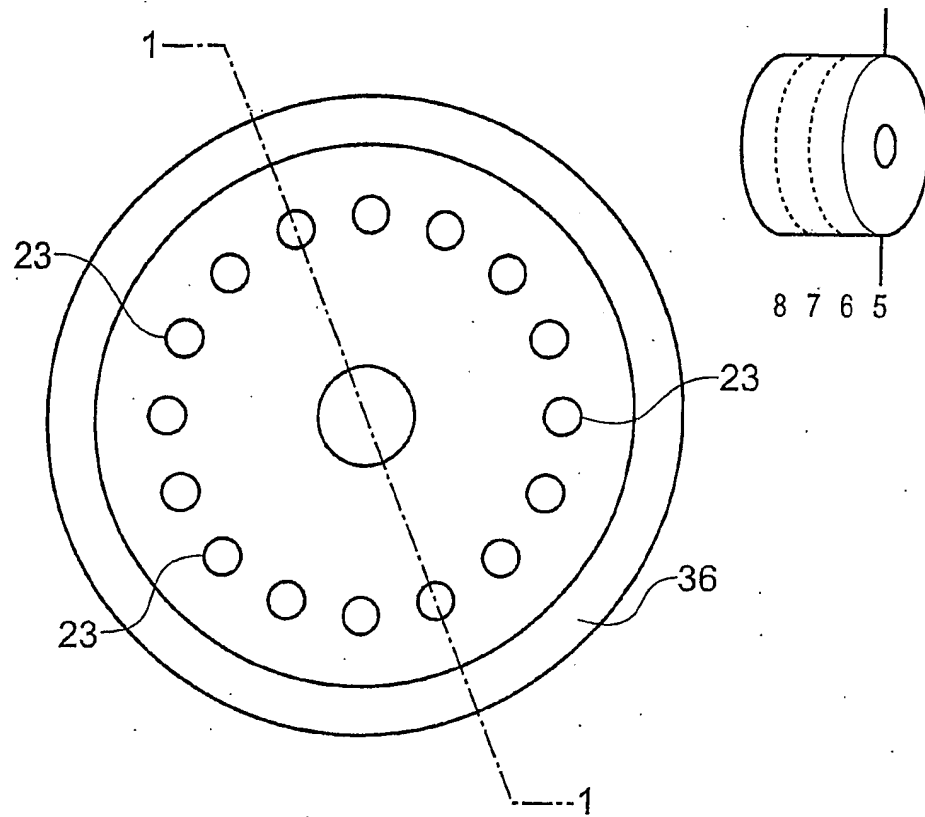


Fig. 8

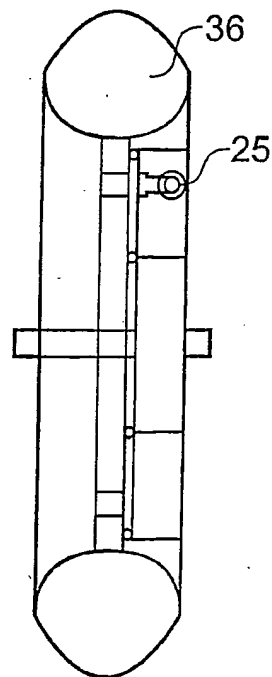


Fig. 9

7/8

10/529773

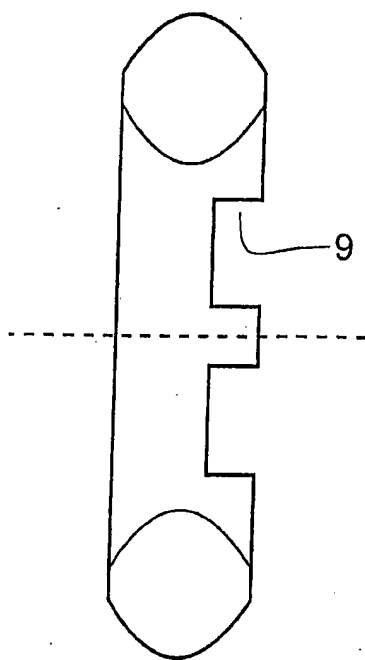


Fig. 10a

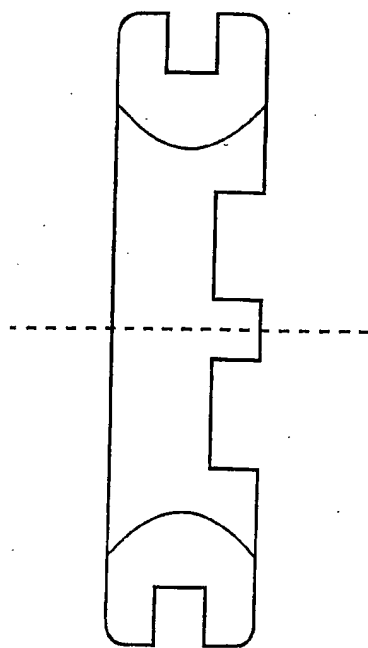


Fig. 10b

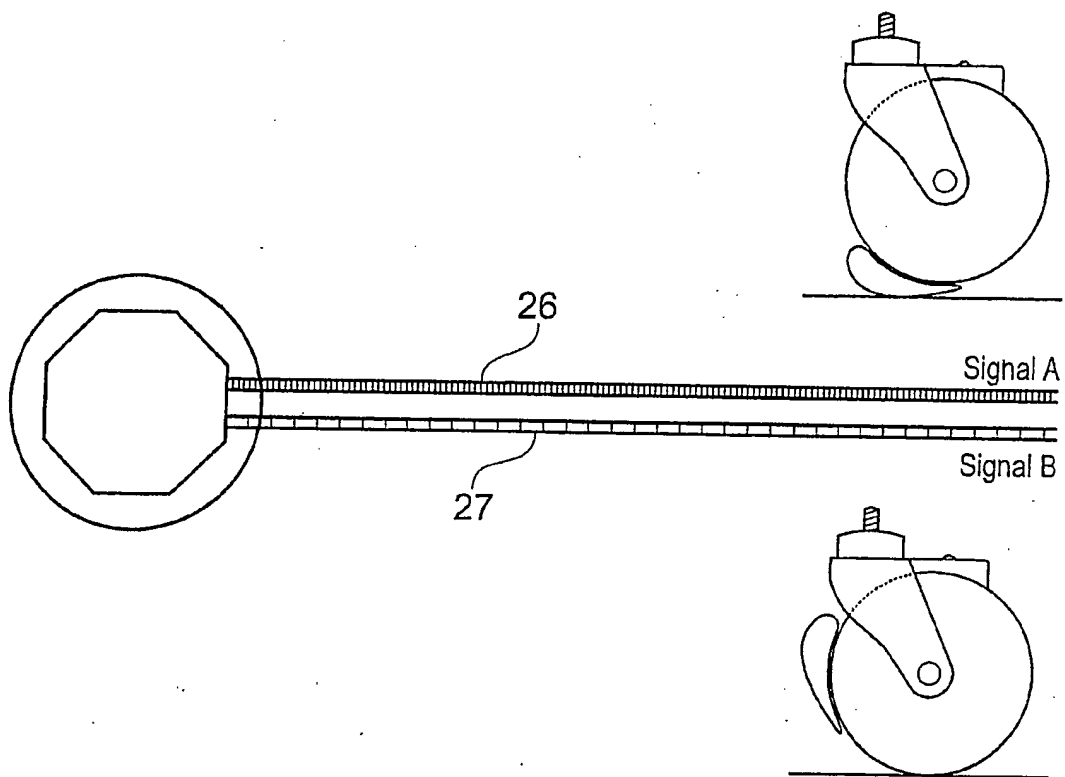


Fig. 11

INTERNATIONAL SEARCH REPORT

Intern. Application No
03/04095A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B62B5/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B62B B60K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 881 846 A (FRENCH JOHN R ET AL) 16 March 1999 (1999-03-16)	1, 10-16, 21-24, 29, 31-33, 39
Y A	the whole document	2, 34, 35 3, 17, 25, 28, 30
Y A	EP 1 101 685 A (GRAY MATTER ALPHA LTD) 23 May 2001 (2001-05-23) cited in the application the whole document	2 1, 2
	-/--	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

23 January 2004

Date of mailing of the international search report

29/01/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Topp, S

INTERNATIONAL SEARCH REPORT

Inter Application No
708 03/04095

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5881846	A	16-03-1999	AT 246622 T	15-08-2003
			AU 733937 B2	31-05-2001
			AU 6591598 A	11-11-1998
			BR 9812257 A	18-07-2000
			CN 1252767 T	10-05-2000
			DE 69816982 D1	11-09-2003
			EP 0975505 A1	02-02-2000
			ID 23182 A	23-03-2000
			NZ 338066 A	25-05-2001
			US 6125972 A	03-10-2000
			WO 9846469 A1	22-10-1998
EP 1101685	A	23-05-2001	EP 1101685 A1	23-05-2001
			US 6374955 B1	23-04-2002
DE 20205917	U	11-07-2002	GB 2379804 A ,B	19-03-2003
			DE 20205917 U1	11-07-2002